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Recent Developments in the International Geophysical Year Program

JOSEPH KAPLAN, *Chairman*

United States National Committee, International Geophysical Year

IN THE more than two years since the United States National Committee for the International Geophysical Year (IGY) first met at the National Academy of Sciences, both the United States and the world programs have been developed and discussed, budgets have been prepared, money has been voted by the Congress of the United States and allocated by the Committee, and an operating organization has been set up and is fully active. Three earlier articles in NEWS REPORT (*see* Vol. III, pp. 89–92, 1953 and Vol. IV, pp. 17–19, 96–99, 1954) have described these developments up to October 1954. This article will report on some of the most important developments since then.

The United States Program

This program now encompasses work under the following categories: Solar activity, geomagnetism, ionospheric physics, aurora and airglow, longitude and latitude, meteorology, glaciology, oceanography, cosmic rays, seismology and gravity, and rocket exploration of the upper atmosphere. The proposed work in seismology and gravity is an addition to the program presented in the second of the three articles referred to above, and the description given in this article is based on the report of James B. Macelwane, S. J., Chairman of the Technical Panel on Seismology and Gravity. The scope of the United States program is shown not only by the number of fields involved, but also by the fact that it will be conducted in four major geographical regions: *1)* The Arctic and Sub-Arctic; *2)* the middle latitudes of the Northern and Southern Hemispheres, including the United States, Central America, South America, and adjacent parts of the Atlantic and Pacific Oceans; *3)* the Equatorial Pacific, largely the Micronesia group of island possessions and trust territories of the United States; and *4)* the Antarctic and Sub-Antarctic.

With the sailing of the U.S.S. *Atka* to Antarctica on December 1, 1954, the United States began its participation in the IGY. Eight nations are expected to cooperate in this region, and several of these have already begun Antarctic operations. Scientists aboard the *Atka* studied coastal sites for planned United States bases. They also conducted experiments in meteorology, radio communications, cosmic rays, and related fields in geophysics.

Committee and Technical Panel Structure

From the start of the planning, the United States National Committee was fully aware of the need for broad participation. This is perhaps most rapidly and best illustrated by describing its committee and panel structure although even this does not give a full measure of the participation of scientists and others in the program. The five principal groups which are involved in planning this program are: *1)* The United States National Committee with 26 members, of whom six are ex-officio; *2)* the Executive Committee of the National Committee, composed of nine members and three alternates; *3)* the Secretariat, directed by Hugh Odishaw; *4)* Regional Committees, only one of which has been activated, the Antarctic Committee headed by L. M. Gould, President of Carleton College; and *5)* twelve Technical Panels.

The technical panels were set up in order *1)* to review the specific expenditures and activities as they are planned for assignment to and execution by various groups of scientists, *2)* to coordinate activities among projects and related fields, and *3)* to direct the execution of and to conduct reviews of the scientific work in the various IGY fields. These panels have been and will continue to be a guarantee of wide participation in the program, as well as of a critically reviewed and effectively executed enterprise.

International Aspects

The international aspects of the program have been presented at several briefings and other occasions by Lloyd V. Berkner, Vice-Chairman of the Special Committee of the International Geophysical Year (CSAGI), and by Sydney Chapman, Chairman of CSAGI, in three notes in Nature (*see* Vol. 172, pp. 327–329, 1953 and Vol. 175, pp. 55–56, 402–406, 1955). The second note gives an excellent account of the two full meetings of CSAGI held in Brussels in July 1953 and in Rome last fall. A third meeting will be held in Brussels in September 1955. At the Rome meeting, more than one hundred scientists from about thirty nations studied and coordinated the various branches of the program. The U.S.S.R. was represented at the meetings of the International Union of Geodesy and Geophysics that preceded the CSAGI meetings, and two of their representatives attended the final plenary session of CSAGI on October 4. The U.S.S.R. announced its intention to participate in the IGY at the end of that plenary session.

President Eisenhower, in a public statement, has warmly endorsed the IGY as one that will "very materially strengthen our bonds with the many cooperating nations and make a constructive contribution to the solution of mutual problems." His Holiness Pope Pius XII has likewise commended the enterprise as one likely to contribute to a more peaceful and cooperative attitude among the peoples of the world, as well as to their material betterment. One must also mention that the United States group in Rome played their parts in an outstanding manner and were well received throughout both the Union and subsequent CSAGI meetings. As indicated in an earlier issue of NEWS REPORT, the IGY was the dominant theme for some four or five international meetings last summer.

The Budget

Late in 1953 and early in 1954, working under tremendous pressure, the National Committee, assisted by the National Science Foundation, prepared a special budget request for 13 million dollars for participation in the IGY. This was approved in principle by the Bureau of the Budget. Of this amount 2.5 million dollars was necessary for the fiscal year 1955, primarily for the procurement of scientific instruments, equipment, facilities, and rockets requiring approximately two years' time lead. This was the amount requested from the United States Congress for 1955. The balance was to be included in the estimates for fiscal year 1956. Congress approved 2 million dollars of the 2.5 millions requested, and this year the Bureau of the Budget allowed the National Committee to go to Congress for the remaining 11 million dollars. The United States House of Representatives has already approved 10 of the 11 million dollars. This budget reflected a careful analysis of the program needs as they appeared in 1953–54, but it did not include additional budget

needs totaling about 4.5 million dollars which resulted largely from three developments at the Rome meeting of CSAGI last autumn—added work in the Antarctic, added work in the Equatorial Pacific, and major programs in seismology and gravity.

Seismology and Gravity Program

Seismology. It is known that some of the largest earthquakes have occurred in the Sub-Antarctic region and that earthquakes are occurring on the Antarctic continent itself, but there is little known of the regional seismicity or liability to earthquakes of the various parts of the Antarctic continent. This knowledge is essential to a rational program for scientific installations. Enough information was gathered during the Byrd and Ronne expeditions to serve as a sample and to indicate what might be done with a more systematic study by means of several observing stations. The seismic program recommended by the Panel on Seismology and Gravity includes an adaptation of the methods used in seismic prospecting for oil to the measurement of the depth of the ice on the continental border and over the Antarctic continent and a mapping of the buried rock surfaces. It also recommended the establishment of three stationary centers for the location of Antarctic and Sub-Antarctic earthquakes with a view to studying the earth's deeper structure and locating any earthquake rifts or zones of instability that may occur in the Antarctic continent, as well as studying the various types of microseisms and their relation to meteorological conditions. These stations will be coordinated with the international network and with special installations in other parts of the earth for the study of the earth's crust and the deep interior. The Panel also recommended the study of strain accumulation in the earth which leads to danger of earthquakes, thus providing a possible approach to earthquake forecasting and a program for the study of the accumulation of strain in the solid earth under the pull of the sun and the moon. The Panel recommended a continuation and expansion of seismic exploration in the bed of the Atlantic and Pacific Oceans in connection with suggested other studies.

Gravity. Our knowledge of the earth's true shape and our approximation to the nearest geometric solid that will represent the average figure of the earth is far from complete. One of the most necessary sources of information lies in the direction and strength of the pull of the earth, the intensity of the gravity field, and the direction of the plumb line. This varies from place to place and can only be determined by accurate measurements. The small details of departure from what might be expected on the basis of average conditions are used in gravity prospecting for minerals and petroleum. The larger and more extensive departures or anomalies of regional character complicate the problem of the shape of the earth. Both types of gravitational anomalies have an influence on the precision of our measurements involved in the laying of the basic network for air maps and even affect the precision of astronomical measurements. Over vast areas in the oceans our knowledge is fragmentary; and we know next to nothing about the direction of the plumb line and the strength of gravity in the Antarctic and Sub-Antarctic regions. This great gap in our knowledge has a large influence on the validity of the conclusions we draw with regard to the shape of the earth.

In order to make use of the opportunities offered by the IGY, the Panel on Seismology and Gravity recommended a number of gravitational studies. One of the methods of determining the strength of the pull of gravity is by means of pendulums whose period of swing can be measured with high precision. The pendulums can be readily swung in fixed installations but can also be made to operate in submarines. Another method of securing information over a wide area consists in the use of a portable instrument called a gravity meter or gravimeter. Gravimeter measurements can be coordinated with seismic exploration methods and can be carried out by the same personnel. It is the hope of the Panel that the great gap in the international network of gravity observations now extending over the greater part of the Southern Hemisphere may be filled in the course of the IGY thus supplying the means for reliable base maps of the whole world.

Conference on the Production of Physicists

JOHN S. COLEMAN

Executive Secretary, Division of Physical Sciences

WHEN permitted free choice, today's students in the schools and colleges throughout the United States appear to have developed an alarming distaste for science and mathematics. This is at least one interpretation which can be placed on the masses of data and statistics which have been gathered and published by reputable investigators in recent years. Their findings, in turn, have generated sharp concern on the part of thoughtful scientists as individuals and as members of organizations having varying degrees of responsibility for the general health and vigor of science.

It is difficult perhaps, to understand why, in face of the rapidly expanding opportunities, support, and public recognition of science, there should be this marked decline in interest. Nevertheless, the significance of the impressive evidence painstakingly collected by such groups as the Commission on Human Resources and reported by Dael Wolfle in "America's Resources of Specialized Personnel" (1954) is inescapable. If any reader of NEWS REPORT is still unaware of this situation he should turn to Wolfle's volume and the numerous papers he will find in the literature relating to his own field. The purpose of this article is not that of confirming the existence of the problem or defining its extent, but rather that of reporting the actions of the Academy–Research Council's Division of Physical Sciences to combat and check these trends, particularly as they relate to physics.

However disturbed the chemists, biologists, or mathematicians may be by the communications pouring in from the educational front, their unhappiness is pale indeed in comparison with the dismay of the physicists who examine the statistics of current high-school science enrollments that have been provided by W. C. Kelly[1] in a recent issue of *Physics Today*. Figure 1, reproduced from Kelly's article leaves no room for complacency.

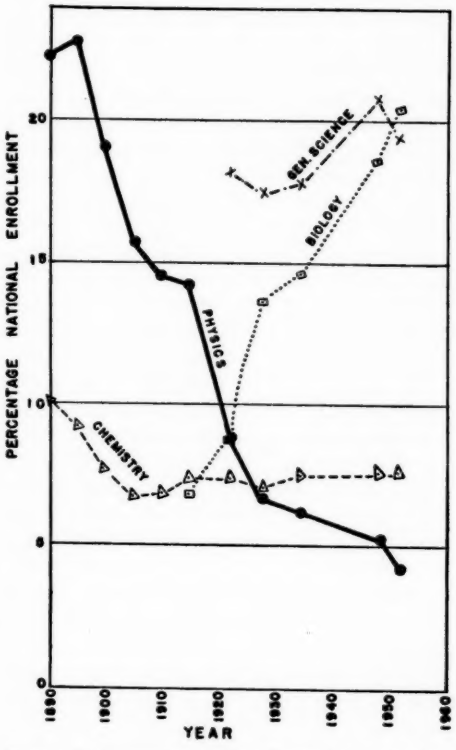

Figure 1.—Percentage national enrollments in four science courses, 1890–1952. (Reprinted by permission from *Physics Today*.)

The decision to undertake an active program to improve the quality and quantity of new physicists was made by the membership of the Division at their 1954 annual meeting at which this question was given priority as the principal topic for consideration and discussion. The various members, while recognizing many contributing fac-

[1] Kelly, W. C. "Physics in the Public High Schools." Physics Today 8(3): 12–14, illus. 1955.

tors, shared the conviction that inadequate and uninspired teaching was the tap root of the problem. Consequently, the Division was charged with initiating a program in cooperation with other interested agencies which could be expected to result in improved teaching, especially at the secondary-school levels. As a first step it was agreed that a conference of concerned scientists and science educators should be organized to examine possible courses of action and to lay out a realistic, immediate program toward which physicists particularly, together with those interested in the education or utilization of physicists, could direct their efforts effectively.

A planning committee was organized under the chairmanship of George D. Harrison, Dean of Science at the Massachusetts Institute of Technology, with the following members: N. H. Frank, Professor of Physics, Massachusetts Institute of Technology; W. W. Grigorieff, Oak Ridge Institute of Nuclear Studies; Philip Johnson, School of Education, Cornell University; Paul E. Klopsteg, National Science Foundation; R. Bruce Lindsay, Dean of the Graduate School, Brown University; W. G. Pollard, Director of the Oak Ridge Institute of Nuclear Studies; R. S. Shankland, Professor of Physics, Case Institute of Technology; and Fletcher Watson, Graduate School of Education, Harvard University. Brian O'Brien and John S. Coleman of the Division also participated. An agenda was prepared which provided for four working groups drawn from the conference participants to sift from the prepared material and discussions a set of recommendations that could be adopted by physicists, industry, education, and government and that the conference participants, as individuals, could also accept as a personal program.

Under the co-sponsorship of the American Institute of Physics and with funds provided by the National Academy of Sciences, industry, and the National Science Foundation, the Conference on the Production of Physicists was held from March 31 to April 2 at the Greenbrier Hotel in White Sulphur Springs, W. Va. The Conference was highly successful in meeting its objectives. The participants, representing an impressive range of individual competence and organizational viewpoints, not only were able to agree unanimously on the requested four sets of recommendations but also, by informal agreements and commendable willingness, allocated and individually accepted responsibility for initiating many constructive actions without further delay.

A running account of the proceedings together with a complete set of the Conference recommendations will appear in *Physics Today*, which is devoting its entire June issue to this purpose. While the recommendations will thus reach most physicists, other areas of science will also be interested, since, at the high school level, the problems faced are by no means unique to or specifically identified with physics. Because the readers of NEWS REPORT represent a very wide range of scientific interests, a summary of the principle recommendations has been extracted from the proceedings and is given below.

It was the sense of the Conference, as reflected throughout the discussions and in the final recommendations of the working committees, that while agencies of the Government and industry recognize fully the importance of physics to the nation and are vitally concerned with the problems of physics education, the ultimate responsibility for planning effective action must rest with the physicists themselves. There was also a widely held conviction that specific programs to foster the study of physics must be geared to the local needs of communities and their schools, teachers, and students.

The members of the conference, many of whom had had firsthand experience in the administration of programs in aid of science education, had access to a large amount of information concerning actions that have already been taken by public and private agencies. The recommendations of the working committees were therefore drafted in full appreciation of the broad problem and with much detailed knowledge of individual programs in progress. It was emphasized that the Conference results should be brought to the attention of scientists, educators, and science teachers and that a continuing organization be established to translate the recommendations into action.

The initiative of Government agencies and industrial concerns in creating programs that have contributed to the education of science teachers was commended by the Conference. These have taken the form of support for summer institutes, grants, fellowships, and other measures, and the Conference urged that they be continued and expanded both in scope and in number. In particular it was recommended that additional colleges and universities be encouraged to organize summer courses for high school teachers and that industry and the Government be encouraged to provide still more scholarships to cover the expenses of those taking part. To insure the highest measure of success in such undertakings, it was urged that arrangements be made for the participation of outstanding physicists in the summer institutes, and it was emphasized that every effort should be made to inform all secondary school science teachers of the opportunities for further study offered by summer programs.

The matter of summer employment of high school science teachers as a means of learning firsthand the application of science in industry received the attention of the Conference. It was recommended that industry be approached with a plan for setting up a "central national clearinghouse" to provide a mechanism for alerting companies to the availability of individual teachers for summer employment.

Among the areas of need in which professional physicists can profitably exert themselves, perhaps the most important is that for improving introductory college physics courses in order to increase the number of physics majors among those enrolled. It was also recommended that physicists make their services available as advisors in the planning and preparation of texts and other teaching aids. It was recognized that the burden of responsibility in the field of physics education is primarily that of the American Association of Physics Teachers (AAPT) and that many of the Conference recommendations coincide with current objectives of the Association. The Conference urged, however, that the AAPT make every effort to obtain the participation of physicists outside their own organization. In particular, the Conference called for the establishment of a joint committee of the AAPT and the American Physical Society, with membership drawn from other member societies of the American Institute of Physics as well, to cooperate with committees from organizations in other fields of science and education in taking steps to increase the effectiveness of high school teaching in the physical sciences and mathematics.

Information concerning school equipment and personnel deficiencies which interfere with effective physics teaching should be collected and made public by the Government, and consideration should be given to such needs as may be indicated for Government aid to states and localities. The Government was also urged to give special attention to the effects of its manpower policies and actions on teaching and the production of physicists.

It was further recommended that consideration be given to the special problems of education for the nation's more talented young during the White House conference on education. Some agency, whether public or private, should be encouraged to examine the possible benefits to the nation of giving special attention to talented high school students, possibly by sponsoring pilot educational programs keyed to the needs of such students. In this connection it was noted that the Southern California Section of the AAPT has been effective in identifying outstanding high school students and bringing them to the attention of colleges. The Conference urged that the physics organizations make such efforts a nationwide practice. Among the possible techniques indicated were the development of local-level "junior academies of science" composed of the best neighborhood science talent, the offering of competitive college scholarships, and the provision of counseling services by qualified physicists. It was suggested that science teachers should be encouraged by their school boards and administrators to arrange special work with superior students, possibly outside of the regular school day, for which they should receive extra pay.

Professional organizations, including member societies of the American Institute of Physics, were asked to work through

their local sections to encourage and assist local scientists and educators in an effort to improve the status, working conditions, and instructional aids required for an effective science program. It was also recommended that means be found, possibly with the help of industry, for taking care of the travel expenses of science teachers attending meetings of their professional organizations.

Finally, the Conference declared, a broad program designed to improve the public understanding of physics, particularly the non-weaponeering variety, should be developed—perhaps with the assistance of industries that came into being as a result of developments in physics.

The publication of the Conference results marks only the beginning rather than the termination of the Division's responsibility. There are several continuing obligations. First of these is the obligation to make available the results of the extensive search and compilation of programs and suggestions prepared for the Conference itself. This material should be directly useful to those who wish to undertake or participate in programs of their own. A second obligation is to continue cooperation in the active program initiated by the Division with the science and mathematics teachers of the Arlington County (Va.) secondary schools for the purpose of gaining firsthand experience in meeting and dealing with problems as they exist and of serving possibly as a convincing model for others to follow. Third, and certainly most important, is the obligation to work wholeheartedly toward securing and joining with the efforts of the other Divisions of the Academy–Research Council and with the many professional societies, organizations, and groups, particularly in science and education, in order to achieve a unified effort which through accomplishment will gain momentum and its objectives.

SCIENCE NEWS

ANNUAL MEETING NATIONAL ACADEMY OF SCIENCES

The ninety-second annual meeting of the National Academy of Sciences was held in Washington, April 25–27, with two hundred and twenty members in attendance. Eight scientific sessions held on Monday, April 25, and Wednesday, April 27, included thirty-eight contributed papers and three symposia of invited papers described below. The business session of the Academy took place on Tuesday, April 26.

This year the Academy's guest-of-honor was Sir K. S. Krishnan, F. R. S., Director of the National Physical Laboratory at New Delhi, retiring President of the National Institute of Sciences of India, and past president of a number of India's other great national scientific bodies. Addressing the members and guests of the Academy at dinner on Tuesday evening, Dr. Krishnan said that in India science has been most valued as a liberalizing force in culture. Because the development of science is more recent in India than in western countries, its applications through technology were only now beginning to have significant impact on the life and economy of India. He paid high tribute to the contributions of American science and the science of other western countries to the growth of science in India and to the furtherance of human welfare there.

Other speakers at the Academy dinner included Sir Harold Spencer Jones, the Astronomer Royal of Great Britain and a foreign associate of the Academy, and Charles Greeley Abbot, former Secretary of the Smithsonian Institution, who was celebrating the fortieth anniversary of his election to the Academy.

The scientific sessions on Monday, April 25, were devoted to contributed papers and to a symposium on "Sound and Its Perception," under the chairmanship of S. S. Stevens. The six invited papers comprising the symposium were distributed in subject matter across the extraordinary scientific breadth of this topic, dealing with its physical, psychological, and physiological aspects.

On Wednesday, April 27, further sessions of contributed papers were accompanied by two additional invited symposia on subjects of unusual current interest. In the first, "Biochemical Pathways of Energy Transfer," five speakers considered the present status of our knowledge of the electronic structure of high-energy bonds, of photosynthetic quantum conversion, of enzymic synthesis of peptide bonds and polynucleotides, and of energy metabolism in muscular contraction. The other symposium on "Modern Concepts in Meteorology," under the chairmanship of Horace R. Byers, included four papers dealing with the application of numerical process to dynamic meteorology, the role of synoptic meteorology in weather prediction, the statistical treatment of weather data in forecasting, and the magnitude of cyclonic patterns in relation to the problems of weather modification.

Five Academy medals and awards were presented in an evening ceremony on Monday. The recipients responded with brief addresses on significant phases of their scientific work. Maurice Ewing received the Alexander Agassiz Medal in recognition of his extensive and pioneering contributions to several lines of oceanographic research. The Daniel Giraud Elliot Medal for the most meritorious work published each year in zoology or paleontology was presented to Libbie Henrietta Hyman in recognition of Volumes II and III in her comprehensive treatise on "The Invertebrates." Peter Mackenzie Millman, National Research Council of Canada, received the J. Lawrence Smith Medal, awarded for fruitful research on meteoric bodies, in recognition of his distinguished work over many years in the observation and interpretation of the spectra of meteors. The Kimber Genetics Award for distinguished scientific contributions in the broad field of genetics was presented for the first time this year; two awards were made: to William Ernest Castle, accepted in his absence by G. Ledyard Stebbins, Jr.; and to Hermann J. Muller.

A reception followed the medal presentations on Monday evening. During the reception, scientific demonstrations and exhibits were on view in the library, reading room, and auditorium of the Academy Building. These were made possible by the cooperation of individual scientists, industrial concerns, and other institutions, who together provided twenty exhibits of significant new discoveries, experimental techniques, and scientific instruments.

Elections of officers and new members were conducted in the business session on Tuesday morning, April 26. These are reported subsequently in this issue. The business session on Tuesday afternoon was devoted to discussion of the Academy's affairs and of its varied undertakings in continuing fulfillment of its role in American science. Highlights of activities of the past year in the general interests of science and in discharge of the Academy's obligation to advise the Government were reported. Continuing enterprises important to the furtherance of science and studies bearing on the relationship of science to the Government and to society were described by the President and by various members directly concerned with these matters.

On Tuesday, the lady guests of Academy members toured the Washington Cathedral and the Textile Museum, which houses a remarkable private collection of Persian and Egyptian tapestries and Pre-Columbian textiles.

SYMPOSIUM ON INDOOR WARNING DEVICES

On May 9 and 10, a Symposium on Indoor Warning Devices for Civil Defense was held at Ann Arbor, Mich., under the joint sponsorship of the Academy–Research Council Committee on Defense and the Engineering Research Institute of the University of Michigan. David M. Dennison of the University of Michigan served as chairman.

The purpose of the symposium was to discuss on a technical basis the advantages and disadvantages of ten types of warning devices. Representatives of power, telephone, and broadcasting companies responsible for furnishing the signal made technical criticisms and suggestions. The minutes of this meeting are to be used as a basis for the design of a system by means of which warning can be passed to substantially everyone in the United States.

ELECTION OF OFFICERS AND MEMBERS NATIONAL ACADEMY OF SCIENCES

At the annual business meeting of the Academy on April 26, Hugh L. Dryden, Director of the National Advisory Committee for Aeronautics, was elected Home Secretary for a four-year term. E. A. Doisy, St. Louis University School of Medicine, Theophilus S. Painter, University of Texas, and James Gilluly, United States Geological Survey, Denver, Colo., were elected members of the Council of the Academy. Dr. Doisy and Dr. Painter will serve three-year terms and Dr. Gilluly will complete the unexpired term of Dr. Dryden which terminates June 30, 1956. Dr. Doisy and Dr. Painter will replace Robert F. Loeb, Columbia University College of Physicians and Surgeons, and Wendell M. Stanley, Biochemistry and Virus Laboratory, University of California at Berkeley, who will complete their three-year terms on the Council on June 30, 1955.

The following members and foreign associates were elected to the Academy:

New Members of the Academy

WILLIAM FOXWELL ALBRIGHT, Professor of Semitic Languages, Johns Hopkins University.

LAWRENCE ROGERS BLINKS, Professor of Biology, Stanford University, and Director, Hopkins Marine Station, Pacific Grove, Calif.

RICHARD DAGOBERT BRAUER, Professor of Mathematics, Harvard University.

HARRISON SCOTT BROWN, Professor of Geochemistry, California Institute of Technology.

ROBERT KYLE BURNS, Embryologist, Carnegie Institution of Washington.

SUBRAHMANYAN CHANDRASEKHAR, Professor of Theoretical Astrophysics, Yerkes Observatory, University of Chicago.

JOHN CHIPMAN, Professor of Metallurgy, Massachusetts Institute of Technology.

CARLETON STEVENS COON, Curator of Ethnology, University Museum, University of Pennsylvania.

RICHARD COURANT, Professor of Mathematics and Director, Institute of Mathematical Science, New York University.

GILBERT DALLDORF, Director, Division of Laboratories and Research, New York State Department of Health.

PAUL HUGH EMMETT, Senior Fellow, Mellon Institute.

RALPH WALDO GERARD, Professor of Neurophysiology, Neuropsychiatric Institute, University of Illinois.

KURT GÖDEL, Professor of Mathematics, Institute for Advanced Study, Princeton, N. J.

RAYMOND GEORGE HERB, Professor of Physics, University of Wisconsin.

JOHANNES HOLTFRETER, Professor of Zoology, University of Rochester.

MARION KING HUBBERT, Research Geologist, Shell Oil Company.

NELSON JORDAN LEONARD, Professor of Chemistry, University of Illinois.

COLIN M. MACLEOD, Professor of Microbiology, New York University College of Medicine.

HORACE WINCHELL MAGOUN, Professor of Anatomy, University of California Medical Center.

DEANE MONTGOMERY, Professor of Mathematics, Institute for Advanced Study, Princeton, N. J.

PHILIP MCCORD MORSE, Professor of Physics, Massachusetts Institute of Technology.

JOHN ROBINSON PIERCE, Director of Electronics Research, Bell Telephone Laboratories, Inc.

CHARLES PHELPS SMYTH, Professor of Chemistry, Princeton University.

ESMOND EMERSON SNELL, Professor of Chemistry, University of Texas.

KENNETH WARTINBE SPENCE, Professor of Psychology, State University of Iowa.

GEORGE EUGENE UHLENBECK, Professor of Theoretical Physics, University of Michigan.

ROBLEY COOK WILLIAMS, Professor of Biophysics and Biophysicist for the Virus Laboratory, University of California at Berkeley.

DAVID WRIGHT WILSON, Professor of Physiological Chemistry, School of Medicine, University of Pennsylvania.

PERRY WILLIAM WILSON, Professor of Bacteriology, University of Wisconsin.

SAUL WINSTEIN, Professor of Chemistry, University of California at Los Angeles.

Foreign Associates:

MAX BORN, formerly Professor of Physics at the University of Göttingen, now retired, Bad Pyrmont, Germany.

BERTIL LINDBLAD, Director, Stockholm Observatory, Sweden.

ANDRÉ LWOFF, Head of the Department of Microbial Physiology, Institut Pasteur, Paris.

SIR ALEXANDER TODD, Professor of Chemistry, Cambridge University, England.

CARDIOVASCULAR RESEARCH PROJECT

A Cardiovascular Research Project, sponsored by the National Heart Institute, has been established within the Chemical–Biological Coordination Center (CBCC). I. D. Welt, formerly on the staff of the Biology Group of CBCC, will be in charge of the new project under Karl F. Heumann, Director of the Center. The primary objective of the project is the coding, abstracting, and filing of the effects of chemicals on the cardiovascular system. The world literature on the subject will be covered, and bibliographic publications will be issued from time to time. All data will be integrated with the CBCC files and will be available to research workers.

LECTURE BY BERTIL LINDBLAD

On Tuesday, March 15, Bertil Lindblad, President of the International Council of Scientific Unions and Director of the Stockholm Observatory in Sweden, presented a lecture on "Star-Streaming in the Galaxy" as part of the Academy–Research Council lecture series. Professor Lindblad opened his lecture with a brief history of our understanding of the structure of the galaxy. The earliest informed opinions, he said, assumed that the Sun lay at the center of the galaxy. Later it was inferred from the distribution of globular clusters that the center of the galaxy lies in the direction of the constellation Sagittarius, with the Sun well out toward the periphery. Interest then turned to determining whether the direction of motion and the velocity of the Sun and other stars were random or exhibited overall patterns of some kinds.

In 1904, Kapteyn developed evidence that the stars in the vicinity of the Sun could be grouped into two distinct streams. Later observations confirmed that these motions were indeed non-random, and it was deduced that our galaxy is a rotating system.

It soon became evident, Professor Lindblad continued, that this vast system does not rotate as a rigid body, but that there exist regions of local inhomogeneity. Oort in Leyden measured the differential rotation of stars near the Sun's orbit and found strong evidence of a system of rings or streams of stars with increasing angular velocities near the center of the galaxy. That point, reached some 15 to 20 years ago, marked the beginning of modern work on the spiral nature of our galaxy. It was apparent that our own galaxy resembles in a general way the spiral galaxies that are observed as our neighbors in intergalactic space, but the existence of spiral arms in our system was still uncertain. Convincing evidence was derived from studies of clusters of Population I stars first identified by the Soviet astronomer, Ambartsumyan. The distribution and motion of these systems showed that they fall into clearly defined streams in the galactic plane that are almost inescapably interpreted as spiral arms. Striking support of this conclusion is afforded by the distribution of radio noise from interstellar hydrogen postulated in 1944 by Van de Hults in Leyden and observed since by radio-astronomers.

Professor Lindblad pointed out that while the spiral structure of extragalactic systems is apparent and spiral arms in our own galaxy are beginning to be discerned, the motions of these systems are not yet well enough known for us to be able to determine their dynamics. A current question, for example, is whether the spiral arms lag the direction of rotation or lead it. Dynamic calculations of his own, Professor Lindblad said, suggest that the spiral arms open outwards leading the direction of rotation. Other dynamic systems could be postulated that would produce the opposite result, and it is yet quite impossible to choose among them.

Professor Lindblad closed his lecture with a breathtaking glimpse into deep space where with increasing distance the galaxies rush into the void at an ever faster rate. "Much remains to be learned," he said, "of the motions and properties of the galaxies to produce a clearer and deeper insight into the fundamental laws of the universe which it is the goal of astronomy to unveil."

ACADEMY TO STUDY EFFECTS OF ATOMIC RADIATION

At the request of the Rockefeller Foundation the National Academy of Sciences will undertake a broad appraisal of present knowledge about the effects of atomic radiation on living organisms and will seek to identify questions upon which further intensive research is urgently needed. The study has been assured adequate financial support for a well-rounded program by the Rockefeller Foundation, which has already made an initial grant for planning purposes.

Lewis L. Strauss, Chairman of the U. S. Atomic Energy Commission, has assured the Academy and the Foundation of the Commission's full cooperation with the study. Extensive studies of radiation effects have been sponsored by the Commission since its establishment, and data from these will be made available for the new study.

Citing the wide differences of opinion regarding the nature and degree of human hazards involved in the use of atomic energy, Detlev W. Bronk, President of the Academy, said that the Academy welcomed the opportunity to make a dispassionate and objective effort to clarify the issues.

The Academy will appoint a committee of eminent scientists and a staff to deal with the problem. The investigations, deliberations, and ultimate reports of the Academy committee will deal with all phases of the biological effects of the increasing use of atomic energy. The committee will collect and evaluate available scientific information bearing on these problems; formulate whatever conclusions are, in its judgment, warranted by the available evidence; identify problems which require further research; and initiate such investigations. A searching appraisal of the state of medical knowledge regarding therapy and protection is also projected. Finally, the committee will evaluate the availability of information on these matters to scientists, physicians, and the general public.

ANNUAL MEETING
DIVISION OF EARTH SCIENCES

The Division of Earth Sciences held its annual meeting on Saturday, April 30. In addition to the regular business of the Division, part of the program was devoted to matters related to the Division's interest and activities. Invited speakers and their topics were:

1) "The National Research Council," S. Douglas Cornell, Executive Officer, Academy–Research Council.
2) "New Activities of the Weather Bureau's Division of Climatology," Helmut Landsberg, U. S. Weather Bureau.
3) "Problems of Disposal of Radioactive Waste Products," J. A. Lieberman, Atomic Energy Commission.
4) "A National Atlas for the United States," Carleton P. Barnes, U. S. Department of Agriculture.
5) "Activities and Problems of Fellowship Screening Committees," E. N. Goddard, University of Michigan.
6) "Recent Developments in the Applications of Clay Mineralogy to Problems of the Oil Industry," R. A. Rowland, Shell Oil Company.

About 50 members and guests of the Division attended the meeting and took part in the discussions.

LECTURE BY
HERMANN WEYL

Warning his audience at the outset that he would not answer the question posed by the title of his lecture, "Why is the World 4-Dimensional?", Hermann Weyl, Professor Emeritus of Mathematics and Member of the Institute for Advanced Study at Princeton, N. J., proceeded to outline in his lecture on March 29 what, in our present state of knowledge, might indicate the direction where the answer lies.

Professor Weyl first gave an idea of what dimension means: It is the number of coordinates necessary to distinguish the elements of a manifold. However, this definition makes sense only if the manifold is a continuum and the coordinates are continuous functions of the variable element.

The world, the manifold of space-time points ("here-now") is 4-dimensional. According to the theory of special relativity, its casual and kinematic structure is not described, as Newton assumed, by the layer of "simultaneity" and the fiber of "rest" going through a given world point O, but by the light cone issuing from O. It is this cone that separates active future from passive past. In terms of suitable coordinates x, y, z, t for which O is the origin, it is defined by the vanishing of the quadratic form $x^2 + y^2 + z^2 - t^2$ of "inertial index 1." General relativity, using arbitrary coordinates, replaces this form by a quadratic form of the relative coordinates dx_i of two infinitely near points (x_i) and $(x_i + dx_i)$ of index 1 with *a priori* unpredictable coefficients depending on (x_i): manifold endowed with a flexible Riemannian metric of index 1. This notion is not bound to the special dimensionality 4, simply because the words "quadratic form of inertial index 1" make sense for any number n of variables.

Passing from the metric structure and the gravitational field determined by them to the other laws of physics we find that all of them, as far as we know them, including Dirac's quantum equation for the electron-positron field, are such as to allow immediate generalization to n dimensions. It may be advisable to connect dimensionality n with the rank e of the linear differential

form representing the electromagnetic field and the inertial index r. The speaker gave some reasons for the equation $r = 1$, $e = r + 1$, $n = 2e$. But the argument for the last equation ("conformal invariance") is not universally valid and hence little convincing.

Thus the general laws of physics show no predilection for a special value of n; however their consequences, when pursued far enough, may behave differently. For instance in an even-dimensional, but not in an odd-dimensional, world complete darkness spreads around a candle when it is blown out. The spherically symmetric solutions of Schrödinger's wave equation for the electrostatic field around a point charge, and hence the energy spectrum of the hydrogen atom, behave very differently for different dimensions. The same holds for the structure of the orthogonal group consisting of the linear transformations leaving a given quadratic form invariant. Perhaps the most striking such differences have recently turned up in the homotopy theory of spheres, which is concerned with continuous mappings of a sphere upon a sphere of lower dimensions. But all these are disconnected instances none of which seems to provide a sufficient reason for the Creator to have chosen the dimension 4 for the world. Shall we find better answers to our problem as we penetrate deeper and deeper into the construction of the universe?

CONFERENCE ON RADIATION CATARACTS

The Sixth Annual Conference on Radiation Cataracts was held under the auspices of the Committee on Radiation Cataracts on March 18. When this program was initiated in 1949, in response to a pressing need revealed by cataract formation in a number of young physicists exposed to cyclotron radiations, quantitative biological investigations were severely limited by inadequacies in dosimetry. The Committee addressed itself energetically to this critical issue and this most recent conference provided a measure of its success. While some problems remain, especially with respect to the measurement of mixed radiation, on the whole dosimetry of a high order of exactitude is now available to the biologist and is increasingly reflected in the elegance of the qualitative biological studies reported.

It has, consequently, been possible to define with greater accuracy than heretofore the relative biological efficiency (RBE) of neutrons with respect to the lens. Much credit for this progress is due to the group working under the leadership of K. Z. Morgan at the Oak Ridge National Laboratory.

The effective cooperation of the U. S. Air Force and of the Military Air Transport Service made it possible to bring to the conference Professor Jean Nordmann of the University of Strasbourg. Dr. Nordmann reported his studies on enzymes in X-ray cataract formation.

The Proceedings of this conference are being edited and will be made available, as heretofore, to all interested investigators in this field.

Concomitantly with its research program, made possible by Atomic Energy Commission support, the Committee has sponsored periodic examinations of physicists with known or suspected radiation lesions of the lens. Such an examination, the fifth, was made at the Wilmer Institute, Johns Hopkins Hospital, on March 14. Ten were seen. Some progression was observed in known lesions; a number of the group had undergone successful surgery.

In assessing its activity over the past six years, the Committee felt that, in addition to stimulating much valuable biological and biophysical research, it had successfully alerted biologists and physicists not only in the United States but throughout the world to a hazard unrecognized a few years ago and, until recently, ill defined.

MORE DATA NEEDED ON AMINO ACIDS

At its meeting on November 5, 1954, the Food and Nutrition Board moved to activate a standing Committee on Amino Acids which would evaluate the possible usefulness of amino acids as food additives.

With the quantity and quality of protein available in the United States there appears to be no need for amino acid supplementation of foods in this country. However, more data are needed on the amino acid content of typical foods in order to determine whether the United States diet is adequate in certain amino acids.

The Human Nutrition Research Branch of the U. S. Agricultural Research Service, has assembled and is continuing to collect available data. A preliminary report to the committee indicates a shortage of analytical values for cystine and tyrosine in all foods and for all amino acids in such foods as flour, cereals, potatoes, baker's yeast, fresh and processed vegetables, and infant foods. Laboratories having original data are encouraged to communicate with Dr. Esther Phipard of the Human Nutrition Research Branch. Expression of values in terms of milligrams of amino acid per 100 grams of food together with total nitrogen content of the food is desired.

When the committee has acquired an adequate tabulation of amino acids supplied by typical diets, comparison can be made with presently accepted recommended allowances.

The committee will also study the efficacy of added amino acids in animals or in humans from areas where deficiencies have been surmised.

The Board undertook this study upon recommendation of an ad hoc committee under the chairmanship of C. A. Elvehjem, Dean of the Graduate School, University of Wisconsin. The work will be carried on by the following committee:

J. B. Allison, Rutgers University, *Chairman*
J. A. Andrews, General Mills, Inc.
D. M. Hegsted, Harvard Medical School
Esther Phipard, Human Nutrition Research Branch, U. S. Agricultural Research Service
H. H. Williams, Cornell University
J. N. Williams, Jr., University of Wisconsin.

COMMITTEE ADVISORY TO OFFICE OF ORDNANCE RESEARCH

The Academy–Research Council announces the following appointments to the Committee Advisory to the Office of Ordnance Research: J. J. Stoker, New York University, Applied mathematics and numerical analysis; John Bardeen, University of Illinois, Solid state physics; and Bryce L. Crawford, Jr., University of Minnesota, Chemical physics.

The membership of this Committee is drawn from the fields of chemistry, engineering, mathematics, and physics, with five representatives for each.

EPIDEMIOLOGICAL ASSAY OF PLASMA STERILIZATION

To date all attempts to propagate the virus of serum hepatitis or to infect laboratory animals with this virus have proved unsuccessful. Therefore, to provide a definitive test of a proposed method for sterilizing plasma against this virus, it is necessary to treat a sample of plasma of known infectivity, containing virus from patients in the acute phase of hepatitis, and to inject it into human volunteers. The most promising methods of treatment yet tried have failed this test, and each experiment carries a serious risk to the subjects. Accordingly, the Panel on Sterilization of Blood and Plasma has concluded that further tests of this nature cannot be justified unless some new and extremely promising method of treatment becomes available. This situation has intensified the need for an alternative method of approaching the problem.

There is evidence that some of the methods developed in recent years—storage at room temperature for six months, ultraviolet irradiation by new thin-film techniques, and certain chemical treatments—will greatly reduce the infectivity of the acute-phase plasma, even though they fail to sterilize it completely. Furthermore, the virus encountered in blood-bank operations, where all donors are carefully screened for evidence of disease, is probably less virulent to begin with than that employed in the experimental tests. Several centers which routinely employ one or another of the treatment methods or a combination thereof report satisfactory results. The Panel is encouraged to hope that a treatment combining two of these methods will reduce the risk to negligible proportions or eliminate it altogether.

Since it would be difficult to distinguish a low incidence of serum hepatitis from the "background" level of infectious hepatitis in the general population, in view of the long and variable incubation period, the question can be settled only through a large-scale trial involving intensive follow-up of the patients. This would be done in large hospitals having active emergency services. Because the patients in these centers normally receive either plasma or

whole blood, which also carries some risk, it is believed that the hazards of transfusion would not be increased, and might well be reduced. A survey of the problems involved will be undertaken this spring by the Panel, in conjunction with the U. S. Public Health Service and its Communicable Disease Center, with a view to launching a cooperative program in the fall.

AMERICAN GEOLOGICAL INSTITUTE

At the meeting of the Board of Directors of the American Geological Institute in New York, April 1, it was voted to increase the annual number of issues of the *Geological Newsletter* from 9 to 12 and to publish it monthly throughout the year. The *Newsletter* is distributed to 14,000 geologists and geophysicists.

The business officers of the member societies of the Institute met at the headquarters of the Geological Society of America in New York City on March 25. The meeting, which was under the auspices of the Institute, was attended by representatives of nine societies. Chief purpose of the meeting was to exchange ideas about various phases of the business management of the member societies, and to compare methods used by the several business managers and secretaries. The first meeting of this type was held at Tulsa, December 4. Plans are now being made to hold the next meeting at New Orleans in November 1955.

GENERAL ASSEMBLY INTERNATIONAL UNION OF BIOLOGICAL SCIENCES

The United States was represented at the twelfth General Assembly of the International Union of Biological Sciences (IUBS), held at Rome, April 12–16, by the following official delegation: Paul Weiss, Chairman of the Division of Biology and Agriculture, *Chairman;* Ralph Cleland, Dean of the Graduate School at Indiana University; and H. Bentley Glass, Professor of Biology at Johns Hopkins University. American observers were Lawrence Blinks, Associate Director for the Biological and Medical Sciences of the National Science Foundation; Wallace W. Atwood, Jr., Director of the Office of International Relations of the Academy–Research Council; and R. W. Hiatt, Chairman of the International Conference on Marine Biological Laboratories which met at Rome following the IUBS Assembly.

At the eleventh General Assembly of the IUBS at Nice in 1953 preparations for a thorough revision and revitalization of the scientific program and administrative structure of the Union was entrusted to a Policy Board. The recommendations of this board produced the main agenda items for the twelfth General Assembly at Rome.

In contrast to earlier assemblies, which dealt almost solely with administrative matters, the Rome Assembly included a scientific program consisting of seven symposia on topics of international concern in the life sciences *(see* NEWS REPORT Vol. V, No. 2). The chairmen of these sessions are now in the process of formulating in the light of the discussions certain guiding principles to serve the Union in its future policies.

On the administrative side, a new and simplified constitution was drafted and adopted by the Assembly. Its main innovations may be summarized as follows: *a)* The influence of the Sections of the Union and the national adhering bodies in the conduct of Union activities was greatly strengthened through a more democratic organization; *b)* the leadership of the Union, formerly in the hands of a small Bureau of five officers, has been entrusted to an expanded Executive Board of eleven, to be elected at each triennial Assembly following a regular nominating procedure; *c)* new Sections were established for Experimental Psychology, Physiology, and Biochemistry, the latter two to act as liaison groups with the corresponding International Unions of Physiological Sciences and Biochemistry; and *d)* because of the increasing number of Sections, the Union instituted three Divisions, namely: Animal Biology, Plant Biology, and General Biology, each encompassing the appropriate Sections.

In view of its growing activities and services and therefore increased operating expenses, the Union urged adhering countries to increase their annual contributions. The Union likewise instructed its delegation to the forthcoming General Assembly

of the International Council of Scientific Unions to advocate increased country contributions to that body so as to make it administratively independent.

Among resolutions introduced at the Assembly, one requested the United Nations to determine and publicize the hazards to the human race of atomic and thermonuclear tests. On the recommendations of the United States delegation, this was amended to a request to the International Council of Scientific Unions (as the appropriate scientific liaison body removed from the political arena) to initiate the appropriate study and evaluation.

The next triennial Assembly of the IUBS will be held at London in 1958.

UNDERGROUND DISPOSAL OF RADIOACTIVE WASTE PRODUCTS

At the request of the Atomic Energy Commission, the Academy–Research Council through its Division of Earth Sciences, is organizing conferences to study the problems connected with the underground disposal of high level radioactive fission products from nuclear reactors. Despite reports about disposal in the sea and other places, there is as yet no satisfactory solution to the problem, and the wastes are being accumulated today in stainless steel tanks. With the advent of commercial reactors, the volume of wastes will increase and some method of economical but safe disposal must be found.

Two conferences are planned for the fall of 1955, and a report will be made to the Atomic Energy Commission recommending specific research on methods that seem to have a good chance of solving the problem. The conferees will be drawn from experts in the various scientific disciplines concerned and will include representatives from other Divisions of the Research Council.

The steering committee for the conferences has held its first planning session. The committee members are as follows:

HARRY H. HESS, Princeton University, *Chairman*
JOHN N. ADKINS, Office of Naval Research
JOHN C. FRYE, Illinois State Geological Survey
M. KING HUBBERT, Shell Oil Company
CHESTER R. LONGWELL, Yale University
CHARLES V. THEIS, U. S. Geological Survey

WORLD SYMPOSIUM ON APPLIED SOLAR ENERGY

A Symposium on Applied Solar Energy, sponsored jointly by the Association for Applied Solar Energy, Stanford Research Institute, and the University of Arizona, will be held in Phoenix, Ariz., and at the University of Arizona in Tucson, November 1–5. One of the prime objectives of the symposium is to bring together research workers throughout the world and those of industry, business, and government who are interested in the utilization of solar energy in the hope that from this five-day meeting a clearer picture of the unsolved problems, their relationships, and a program for additional research will emerge.

The general sessions in Phoenix will be devoted to summarizing present knowledge and presenting new information on the several phases of solar energy. An exposition of solar devices from various parts of the world will show the present state of engineering development.

The general sessions will be followed by two days of work sessions, or technical sessions, at the University of Arizona. These work sessions will provide an opportunity for presentation of volunteer papers and discussion of solar-energy capture.

Additional information about the Symposium may be obtained from the Mountain States Division, Stanford Research Institute, Suite 204, Mayer-Heard Building, Phoenix, Ariz.

STAFF APPOINTMENTS

David K. Felbeck was appointed staff engineer for the Committees on Ship Steel, Ship Structural Design, and Residual Stresses on April 1. Before coming to the Academy–Research Council, Dr. Felbeck was assistant professor of mechanical engineering at the Massachusetts Institute of Technology.

The Division of Biology and Agriculture has announced the appointment of **Howard I. Cole** as Executive Secretary of the International Conference on the Use of Antibiotics in Agriculture effective May 1. Until recently Dr. Cole was Executive Director of the Committee on Biological Warfare of the Research and Development Board, Department of Defense.

FELLOWSHIP PROGRAMS

AWARD OF FELLOWSHIPS IN THE MEDICAL SCIENCES

The Medical Fellowship Board of the Division of Medical Sciences has administered postdoctoral fellowships in the medical sciences for The Rockefeller Foundation for thirty-three years. Five years ago the National Tuberculosis Association initiated a series of fellowships in tuberculosis, and four years ago the program of the Board was augmented by a grant from the Lilly Research Laboratories.

At the annual meeting of the Board in March 1955, fourteen appointments were made for the academic year 1955–56. The following list indicates the institution from which the recipients received the doctorate, as well as the nature and location of their fellowship research:

Fellowships in the Medical Sciences Administered for The Rockefeller Foundation

Elmer Brown (M.D., Washington University Medical School, 1950)
Iron metabolism as related to the production of hemochromatosis in experimental animals—Washington University, with Carl V. Moore.

George F. Cahill, Jr. (M.D., College of Physicians and Surgeons, Columbia University, 1953)
Hormonal effects on muscle metabolism and electrolytes—Harvard University, with A. Baird Hastings.

Alfred E. Harper (Ph.D., University of Wisconsin, 1953)
Influence of hormones, particularly the growth hormone of the pituitary gland and insulin, on metabolic processes—Cambridge University, England, with F. G. Young.

John H. Luft (M.D., University of Washington, 1953)
The fine structure of the electric organ of the electric eel—Harvard Medical School, with George B. Wislocki.

Jack Orbach (Ph.D., Princeton University, 1954)
A comparison of the effects of cerebral lesions in man and monkey—Montreal Neurological Institute, Canada, with Herbert H. Jasper.

Franklin W. Stahl (Ph.D., Candidate, University of Rochester, 1955)
Genetic aspects of the host-parasite relation in lysogenic bacteria—California Institute of Technology, with G. Bertani.

Charles A. Thomas, Jr. (Ph.D., Harvard University, 1954)
Fractionation of bacteriophage DNA and correlation of genetic features—University of Michigan, with Cyrus Levinthal.

Garson H. Tishkoff (Ph.D., 1951, M.D., 1953, University of Rochester)
The biochemistry of the red cell membrane and the role of the membrane in red cell survival—Tufts University School of Medicine, with William Dameshek.

Jonathan G. Wegener (Ph.D., University of Chicago, 1954)
Some integrative functions of the cerebral cortex—Institute of Living, Hartford, Conn., with Karl H. Pribram.

Fellowships in the Medical Sciences Administered for Lilly Research Laboratories

David G. Cornwell (Ph.D., Stanford University, 1954)
Plasma lipoproteins—Harvard University, with John L. Oncley.

Robert J. Dellenback (Ph.D., Candidate, University of California at Los Angeles, 1955)
Calcium ion and nerve activity—Universität Würzburg, Germany, with H. Autrum.

Joseph C. Shipp (M.D., College of Physicians and Surgeons, Columbia University, 1952)
Studies of ion transport across the renal tubule using radioactive isotopic methods—Harvard Medical School, with George W. Thorn and A. K. Solomon.

Fellowships in Tuberculosis Administered for the National Tuberculosis Association

Leon Cander (M.D., Temple University School of Medicine, 1951)
The factors affecting the diffusing capacity of the lung and the pulmonary capillary blood volume using carbon monoxide technique—University of Pennsylvania, with J. H. Comroe, Jr.

Alfred J. Crowle (Ph.D., Stanford University, 1954)
The immunizing factors of the tubercle bacillus—Stanford University, with Sidney Raffel.

AWARDS IN RADIOLOGICAL RESEARCH

The James Picker Foundation for several years past has made available a limited number of Fellowships and Grants for Scholars in Radiological Research. The Committee on Radiology of the Division of Medical Sciences serves as the administrative and scientific advisory body to the Foundation. Upon recommendation of the Committee, the Board of Directors of the Picker Foundation has approved three Fellowships and one Scholar Grant for 1955–56. The names of the appointees, the institutions from which they received the doctorate, and the nature and location of their research are as follows:

Fellowships

Arnold Berrett (M.B., Ch.B., University of Capetown, Union of South Africa, 1945)
Comparative study of contrast media for cerebral arteriography—Montreal Neurological Institute, Canada, with Donald McRae.

Björn E. W. Nordenström (Med.Lic., Med. Dr., Karolinska Institutet, Stockholm, Sweden, 1947, 1954)
Development of a densometric method for recording of contrast accumulation in tumors—University of Michigan Medical School, with Fred J. Hodges.

Steven E. Ross (M.D., Faculty of Medicine, University of Munich, Germany, 1948)
Radiologic aspects of the growing normal pelvis; developmental and clinical significance—Babies' Hospital, Columbia-Presbyterian Medical Center, with John Caffey.

Grant for Scholar

William J. Tuddenham (M.D., University of Pennsylvania School of Medicine, 1950)
An exploration of new techniques for extending the usefulness of diagnostic radiography—University of Pennsylvania School of Medicine.

FELLOWSHIPS IN THE NATURAL SCIENCES

Nine postdoctoral fellowships in the natural sciences have been awarded for 1955–56. These fellowships are supported by the Lilly Research Laboratories, Merck and Company, and the American Chemical Society and are administered by the Academy–Research Council. The American Chemical Society Petroleum Research Fund fellowships, established in 1954 to provide advanced scientific education and fundamental research in the petroleum field, were awarded for the first time.

The following list indicates the institution from which the recipient received his degree as well as the nature and location of his fellowship research:

American Chemical Society Postdoctoral Fellows

Richard Allan Holroyd (to receive Ph.D. in fall 1955, University of Rochester)
The ethylidene rearrangement—University of California at Los Angeles, with F. E. Blacet.

Edward Carl Thiel (to receive Ph.D. in June 1955, University of Wisconsin)
A geophysical study of the Uinta Mountain range—University of Utah, with A. J. Eardley.

Lilly Postdoctoral Fellows

Ronald Charles David Breslow (to receive Ph.D. in February 1956, Harvard University)
Investigations concerning the chemistry of certain coenzymes—Cambridge University, England, with Sir Alexander Todd.

Robert G. Stanley (to receive Ph.D. in June 1955, University of California)
Biochemical changes leading to the initiation of reproductive structures in genus *Pinus*—Institute of Forest Genetics, Placerville, Calif., with N. T. Mirov.

Jacob Frederick Woessner (to receive Ph.D. in June 1955, Massachusetts Institute of Technology)
Role of coenzyme A in amino acid metabolism—University of Pennsylvania, with Minor J. Coon.

Merck Senior Postdoctoral Fellows

Harlyn Odell Halvorson (Ph.D., University of Illinois, 1952)
Studies on the mechanism of protein synthesis—Service de Physiologie Microbienne, Institut Pasteur, Paris, France, with Jacques Monod.

C. Ralph Stocking (Ph.D., University of California at Davis, 1943)
Biochemical studies of chloroplasts with special reference to starch synthesis—University of Wisconsin, with R. H. Burris.

Joseph Weber (Ph.D., Catholic University, 1951)
Study of the renormalization program and nonperturbation approach to problems in the quantum theory of meson fields—Palmer Physical Laboratory, Princeton University, with John A. Wheeler.

David Walter Weiss (Ph.D., Rutgers University, 1952)
Continuation of studies on the isolation of antigens of tubercle bacilli responsible for their primary toxicity and immunogenic properties—Oxford University, England, with A. Q. Wells.

FELLOWSHIPS IN ELECTRONICS

The Fellowship Office of the Academy–Research Council has announced the award of four pre-doctoral fellowships in electronics for the academic year 1955–56. These fellowships, supported by the Radio Corporation of America, were established in 1947. The following list of appointees indicates the institution from which the recipient received his degree and the nature and location of his fellowship research:

James Franklin Gibbons (M.S., Stanford University, 1954)
Research in electronics—Stanford University.

John Richards Johnson (B.S., Purdue University, 1949)
Determination of the optical constants of semiconductors by reflection—University of Pennsylvania, with P. H. Miller, Jr.

John Eldon Pippin (M.S., Georgia Institute of Technology, 1953)
Applications of the non-reciprocal properties of ferrites and semi-conductors to microwave electronics—Harvard University, with C. L. Hogan.

Richard William Soshea (B.S., University of Minnesota, 1954)
Study of energy level structure of magnesium oxide—Univ. of Minnesota, with A. J. Dekker.

RECORD OF MEETINGS

March	
1	Committee on Agricultural Pests
	International Conference on the Use of Antibiotics in Agriculture, Program Committee
2	Subcommittee on Stress
2–3	Agricultural Board
	Industry Committee on Roof Decks and Built-up Roofing
3–4	Division of Biology and Agriculture, Committee on Educational Policies
8	National Research Council Postdoctoral Fellowship Board
	Panel on Mica
	Subcommittee on Nuclear Reactors, *New York City*
9	Federal Construction Council, Operating Committee
	Panel on Aircraft Plastics
9–10	Committee on International Scientific Unions
10	Panel on Guided Missiles
	Subcommittee on Toxicology
10–12	Committee on Dentistry
	Subcommittee on Biochemistry
	Subcommittee on Biology
	Subcommittee on Clinical Investigation
	Subcommittee on Etiology and Pathology
	Ad hoc Panel on Magnetostrictive Cutting Devices
11	Food Protection Committee
	Division of Physical Sciences, Committee on Symbols, Units, and Nomenclature
11–12	Medical Fellowship Board
12–13	Biology Council
14	Subcommittee on Atmospheric and Industrial Hygiene
	Subcommittee on Waste Disposal
15	Federal Construction Council, Task Group on Space Allowances for Offices
	Committee on Sanitary Engineering and Environment
17	Committee on International Relations in Anthropology
	Building Research Institute, "Plastics Group"
	Committee on Science in Unesco
18	Sixth Conference on Radiation Cataracts
	Committee on International Exchange of Persons
	Committee on Environmental Protection, Subcommittee on Human Resources

March	
21	Committee on Containers
	Ad hoc Planning Group for Conference on the Physiology of Hypothermia
	Subcommittee on the Cardiovascular System
	Panel on Guided Missiles, Sub-panel on Ceramics, Cermets, and Ceramic Coatings
22	Committee on Titanium Sponge Specifications
	Subcommittee on Trauma
22–23	Subcommittee on Radiation Sterilization, *Chicago*
23	Panel on Lithium
24	Building Research Advisory Board
	Federal Construction Council, Task Group on Windows
24–26	Committee on Growth, Section on Fellowships, *Harriman, N. Y.*
25	Committee on Effects of Military Aircraft on Airfield Pavements
	Division of Engineering and Industrial Research, Executive Committee
27–28	Committee on Growth, Executive Committee, *New York City*
28	American Geological Institute, Standing Committee on Government Relations, *New York City*
29	American Geological Institute, Ad hoc Committee on Scope, *New York City*
	Civil Defense Foods Advisory Committee, *Chicago*
	Sub-panel on Mica, *New York City*
30	American Geological Institute, Ad hoc Committee on Organization, Finance, and Program, *New York City*
	American Geological Institute, Standing Committee on Education and Public Relations, *New York City*
	Committee on Ship Steel
	Subcommittee on Nutrition, *Chicago*
	Advisory Committee for Slab-on-Ground Construction
31	Food and Nutrition Board, Executive Committee
	Committee on Cereals
	Committee on Amino Acids
	Committee on Milk, *Chicago*
	American Geological Institute, Executive Committee, *New York City*
	Panel on Guided Missiles, Sub-panel on Materials Research, *Pittsburgh, Pa.*

March

31–April 2	Conference on the Production of Physicists, *White Sulphur Springs, W. Va.*

April

1	American Geological Institute, Board of Directors, *New York City*
1–2	Food and Nutrition Board
3–4	Subcommittee on Radiochemistry, *Cincinnati, Ohio*
4	Colloquium on Research on the Metabolic, Physiologic, and Pharmacologic Effects of Alcohol
	Committee on the National Atlas of the United States
5	Committee on Problems of Alcohol
7	USA National Committee, International Commission on Optics, *New York City*
8–9	Committee on Geography, Advisory to ONR, *Baton Rouge, La.*
	Committee on Loyalty in Relation to Government Support of Unclassified Research
9	Committee on Tables of Constants and Numerical Data
11	Subcommittee on Laboratory Animals
12	Titanium Review Committee
	Sub-panel on Mica
13	Material Advisory Board
	Advisory Board on Quartermaster Research and Development
14	Panel on Manganese
	Conference Board of Associated Research Councils
15	Committee on Veterans Medical Problems
	Steering Committee for Organization of Conferences on Disposal of Radioactive Waste Materials, *Baltimore, Md.*
17	Division of Biology and Agriculture, Subcommittee on College Education, *New York City*
17–19	Building Research Institute, *Princeton, N. J.*
18	Panel on Guided Missiles, Sub-panel on Ceramics, Cermets, and Ceramic Coatings
19	Panel on Blood Coagulation
	Ship Structure Committee, Project Advisory Committee SR-131

April

19–20	Committee on Surface Drainage of Highways, *Stillwater, Okla.*
20	Maritime Cargo Transportation Conference, Steering Committee
	Panel on Plasma and Subcommittee on Shock, Joint Meeting
	Subcommittee on Dairy, Oil, and Fat Products, *Chicago*
21	Committee on the National Atlas of the United States
	Committee on Oncology
	Subcommittee on the American Registries of Pathology
22	Committee on Pathology
	Subcommittee on Radiation Sterilization, *New York City*
22–23	Committee on Soil-Calcium Chloride Roads, *Blowing Rock, N. Car.*
23	USA National Committee, International Union of Pure and Applied Chemistry
	Division of Chemistry and Chemical Engineering, Executive Committee
24	National Academy of Sciences—National Research Council, Governing Board
25–27	National Academy of Sciences, Annual Meeting
	Mine Advisory Committee
26	Panel on Aircraft Plastics
28	Biology Council, Committee on Instrumentation
28–29	Symposium on the Utilization of Chicken Feathers as Filling Materials, *Natick, Mass.*
29	Division of Earth Sciences, Executive Committee
	American Geological Institute, Standing Committee on Professional Relations and Applications, *Berkeley, Calif.*
	Ad hoc Panel on the Establishment of a Hemoglobin Standard
	Ad hoc Panel on Transfusion Equipment
30	Subcommittee on Blood and Related Problems
	Division of Earth Sciences, Annual Meeting
	USA National Committee, International Union of Pure and Applied Physics

NEW PUBLICATIONS

Annual Report of the Conference on Electrical Insulation. 1954 Meeting. Academy–Council Publication No. 368. 1955. 67 p. $3.00.

Atoll Research Bulletin. Nos. 37–40 (bound in one vol.) Pacific Science Board, National Academy of Sciences–National Research Council. May 1955. [89] p., illus.

Basic Mechanisms in Radiobiology. III. *Biochemical Aspects.* Nuclear Science Series Report No. 17. Academy–Council Publication No. 367. 1954. 158 p. $1.50.

Coagulation of Blood. Methods of Study. Leandro M. Tocantins, ed. Grune & Stratton, New York. 1955. 240 p. $5.75.

Island Bibliographies. Marie-Helene Sachet and F. Raymond Fosberg. Academy–Council Publication No. 335. 1955. 577 p. $6.00.

Nonprofit Research and Patent Management Organization. Archie M. Palmer. Academy–Council Publication No. 372. 1955. 150 p. $3.00. (Address orders to: Office of Patent Policy Survey, National Academy of Sciences–National Research Council.)

Parking Requirements in Zoning Ordinances. Highway Research Board Bulletin 99. Academy–Council Publication No. 347. 1955. 55 p. $0.75.

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Note: *A Cumulative Index to Volumes I-IV, 1950–1954, of News Report* (12 p., mimeographed) has been compiled in the Library of the Academy–Research Council. Copies may be obtained on request from the Library.

Notice of Academy Meetings

NATIONAL ACADEMY OF SCIENCES

Autumn Meeting, California Institute of Technology, November 2–4, 1955
Annual Meeting, Washington, D. C., April 23–25, 1956

NATIONAL ACADEMY OF SCIENCES—NATIONAL RESEARCH COUNCIL

Governing Board, Washington, D. C., June 19, 1955

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